DOCUMENT RESUME

ED 467 206 JC 020 554

AUTHOR	Belon, Barbara; Wright, Marie
TITLE	Case Study: Creation of a Degree Program in Computer Security. White Paper.
PUB DATE	2002-06-00
NOTE	9p.; Paper prepared for the National Science Foundation and American Association of Community Colleges CyberSecurity Education Workshop (Washington, DC, June 26-28, 2002).
PUB TYPE	Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*College Curriculum; College Instruction; Community Colleges; Computer Science; *Computer Security; Computers; Crime Prevention; *Degrees (Academic); *Information Industry; Information Technology; Program Implementation; Technology; *Technology Education; Two Year Colleges; Undergraduate Study
IDENTIFIERS	*Data Security; *Norwalk Community College CT

ABSTRACT

This paper reports on research into the field of computer security, and undergraduate degrees offered in that field. Research described in the paper reveals only one computer security program at the associate's degree level in the entire country. That program, at Texas State Technical College in Waco, is a 71-credit-hour program leading to an Associate of Applied Science in Network Technology degree and focuses heavily on computer networks and operating systems, containing courses that prepare individuals for careers on corporate security teams. The majority of computer security and information security training is offered in master's and doctoral-level programs. The paper proposes Norwalk Community College (NCC) in Norwalk, Connecticut, develop a new degree program at NCC. It also details the process of developing the degree program, starting with advisory committee members' development of a knowledge and skills list for entry-level computer security professionals, identification of the components that could be taught in a formal program of study, and the packaging of knowledge and skills components into logical course delivery units. The paper argues for development of similar programs at other community colleges. (NB)

Reproductions supplied by EDRS are the best that can be made
from the original document.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

B. Huffman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED 467 206

Case Study: Creation of a Degree Program in Computer Security

White Paper

Dr. Barbara Belon, Director of the Center for Information Technology
Norwalk Community College
Norwalk, CT
Dr. Marie Wright, Professor, Management Information Systems Department
Western Connecticut State University
Danbury, CT

May 13, 2002

Prepared for the CyberSecurity Education Workshop sponsored by the National Science Foundation and the American Association of Community Colleges, June 26-28, 2002, Washington, DC

This paper describes the process of creating a degree program in Computer Security at Norwalk Community College (NCC), in partnership with a program option in Information Security Management at Western Connecticut State University (WCSU). The events are described in chronological order, as follows:

Awareness and Verification of Need	April 2001
The Research	April 2001 – May 2001
The Idea	June 2001
The Contacts	July 2001 – October 2001
The Process	October 2001 – January 2002
Knowledge and Skills List	
Components	
Courses and Gaps	
The Degree Approval Process	February 2002 – September 2002

Awareness and Verification of Need (April 2001)

In April 2001, a number of articles appeared in national IT weekly periodicals (e.g., ComputerWorld, eWeek, Information Week, InfoWorld) concerning the scarcity of trained computer security professionals in the United States. The articles referenced a high demand for these individuals in both the public and

IC020554

BEST COPY AVAILABLE

private sectors, and an insufficient number of qualified applicants to fill these job openings. Dr. Belon felt it was necessary to verify the shortage of trained computer security professionals among regional companies.

Since Connecticut's Fairfield County is heavily populated with producers of IT products and services, Dr. Belon informally contacted several of the area CIOs. All of them confirmed that they had serious problems hiring qualified computer security personnel.

If such a high demand existed for this skill set, then there was a mismatch between those in need of skilled professionals, and those who could provide qualified candidates.

The Research (April 2001 – May 2001)

The search to find existing computer and information security education programs began in earnest in late April 2001. Several Internet search engines (e.g., Google, Lycos, AltaVista, Yahoo) were used to locate colleges and universities that had accredited degree programs in either computer security or information security. Many Master's and Doctoral degree programs in computer science and information systems were found, most containing only electives in information security or cryptography. Further research identified the twenty-three schools that were certified as NSA Centers of Academic Excellence in Information Assurance Education. However, no focused degree programs in cybersecurity were found at the Bachelor's level. At the Associate's degree level, one program at Texas State Technical College (Waco, TX) was identified. That particular seventy-one credit hour program, leading to an Associate of Applied Science in Network Security Technology, focused heavily on computer networks and operating systems, and contained security assessment and e-commerce security courses that prepared individuals for careers on corporate security teams.

It was apparent that the available resources to train computer security and information security professionals were being poured into the Master's and Doctoral level programs. Therefore, it was no wonder that there were not enough entry-level security professionals to meet corporate demand. Clearly, the single Waco, TX program could not produce the numbers necessary for the U.S. market. Other undergraduate degree programs that were focused on computer security and information security were needed to satisfy the growing demand for professionals in this relatively new field.

The Idea (June 2001)

In June 2001, Dr. Belon presented the idea of developing a new degree program in Computer Security to NCC's president and academic dean. They both endorsed the idea and urged Dr. Belon to continue with her research and begin to make contacts at universities that were known to have graduate programs in computer security or information security. The president of NCC also placed the potential degree development project on the agenda for the next meeting of the President's IT Advisory Committee; a group comprised of CIOs and CEOs from area companies. At their June meeting, the committee members approved the idea of developing a Computer Security degree at NCC, articulated with a four-year school.

The Contacts (July 2001 – October 2001)

NCC Director of Grants and Strategic Planning, Ms. K.C. Senie, assisted Dr. Belon in identifying personnel who were involved in university computer security programs. One of her contacts was with Alan Berg, Administrative Director of the INFOSEC program at James Madison University (Harrisonburg, VA). While discussing James Madison's program and NCC's desire to partner with a four-year institution, Mr. Berg suggested that Ms. Senie contact Dr. Marie Wright, a faculty member at nearby Western Connecticut State University.

Near the end of August 2001, Ms. Senie contacted Dr. Wright, and discussions ensued on the potential to jointly develop a degree program in Computer Security. The idea proposed was that NCC would offer hands-on lab courses in networks and operating systems and introductory security courses, while WCSU would offer the more advanced theoretical courses in information security through their existing Information Security Management program option.

A meeting was arranged on September 14, 2001. The invited group consisted of faculty and administrative representatives from NCC, WCSU and the CT Technology College. Discussions focused on NCC's proposal to develop an Associate's degree program in Computer Security that would mesh with the existing Bachelor's degree program in Management Information Systems/Information Security Management at WCSU. The likelihood of developing a program articulation between NCC and WCSU also was discussed, as was the potential for articulations with other four-year institutions in the state.

Following the meeting, Dr. Belon prepared a draft articulation agreement, which paired the general college core courses in WCSU's degree requirements with

those offered at NCC. This was delivered to WCSU on September 26, 2001, and it met with the approval of WCSU's MIS department and administration shortly thereafter.

During the last week in September, Dr. Belon and Dr. Wright felt that it was time to assemble an advisory committee of computer and information security professionals from the region for the purpose of creating the new degree program. At Dr. Belon's request, the local Society for Information Management (SIM) chapter in Fairfield County e-mailed their membership, telling them about NCC's proposed Computer Security program, and asking anyone with relevant work experience to contact Dr. Belon if they were interested in helping to draft the program/course content. The e-mail was sent out on October 2, 2001. On October 3, calls were received from twelve security professionals representing government, academia, and industry who were interested in participating in the degree development process.

The newly formed Computer Security Advisory Committee membership consisted of the following:

Four individuals from NCC, representing faculty and administration
Four individuals from area businesses, all actively involved in their respective companies' security endeavors
Four individuals from state and local law enforcement
Four individuals from regional four-year higher education institutions

The first Computer Security Advisory Committee meeting was set for October 24, 2001.

The Process (October 2001 – January 2002)

At the first advisory committee meeting, the members were charged with the development of three items:

1) Knowledge and Skills List - a listing of the knowledge and skills needed by entry-level computer security professionals
2) Components - those knowledge and skill components that could be taught in a formal program of study, as opposed to the knowledge and skills that are learned on the job
3) Courses and Gaps - the packaging of knowledge and skill components into logical course delivery units, and the identification of those components that were not covered in any of the existing courses at either NCC or WCSU (i.e., the gap analysis)

These tasks were to be completed over the course of the next two months.

Knowledge and Skills List

During the first advisory committee meeting, most of the time was spent on the first task. The committee members were asked to list the skills needed for jobs in computer and information security. After compiling the list, the committee was guided back through the items, and these were discussed, with more skills added and others deleted or combined for clarity. Some discussion time also was given to the definition of entry-level security positions and what skills would be demanded.

On October 30, 2001, Dr. Belon met with Dr. Wright at WCSU to recap the first advisory committee meeting, and to move the knowledge and skills listing to the next level. Discussions progressed along two lines. First, the knowledge and skills needed for entry-level security jobs, as identified by the advisory committee members, were supplemented by numerous security job descriptions that Dr. Wright had compiled from online regional job postings. Then, the knowledge and skills identified by certification bodies, such as SANS (the System Administration, Networking and Security Institute) and ISC2 (the International Information Systems Security Certification Consortium, Inc.), were incorporated into the existing knowledge and skills list. The objective was to synthesize the knowledge and skill requirements prior to next advisory committee meeting, so that the committee members would be prepared to review and modify the summary listing of skills.

The finite list of knowledge and skill requirements that was produced at the October 30 meeting was e-mailed to the advisory committee members. The members were directed to review the items and be prepared to support their inclusion, deletion or modification at the next advisory committee meeting.

Components

On November 14, 2001, the second Computer Security Advisory Committee meeting was held at NCC. Rather than concentrate on the specific knowledge and skills required for particular security jobs (e.g., security analyst, security administrator), it was decided that job titles should be put aside in order to produce a summary list of requisite knowledge and skill requirements. This list would represent the critical knowledge and skill components that the students should have in order to pursue productive careers in computer and information

security. During the course of the meeting, additions and revisions were made to the list.

On November 27, 2001, Dr. Belon and Dr. Wright met at WCSU. Dr. Wright had reorganized the knowledge and skill requirements identified by the advisory committee members into categories that aligned with the ICS2 Common Body of Knowledge topical areas, and supplemented the knowledge and skills requirements list with additional knowledge requirements from ISC2 and the NSTISS (National Security Telecommunications and Information Systems Security) standards.

On November 28, 2001, the third Computer Security Advisory Committee meeting was held at NCC. Committee work entailed the finalization of knowledge and skill set requirements, along with the sequencing of those items. Final agreement was reached on the content of the Computer Security degree program.

At this point, the work fell to Dr. Belon and Dr. Wright to match the identified knowledge and skill set requirements to the content of courses currently offered at NCC and WCSU.

Courses and Gaps

From December 2001 through January 13, 2002, Dr. Belon and Dr. Wright worked on the identification of existing courses at NCC and WCSU that covered the specified knowledge and skill requirements. Those program skills and knowledge components that could not be matched with existing course content were referred to as "gaps". Once the gaps were identified, they were studied to see how they could be packaged into new courses. Dr. Belon initially outlined four new courses that were needed to deal with the gaps. However, after further analysis, it was determined that the number of new courses required could be reduced to three.

During this time, Dr. Belon also completed writing the degree application package that would be submitted to the various approval bodies within Connecticut for accreditation and licensure of the program. By January 13, 2002, both Dr. Belon and Dr. Wright felt that the packaging of the skills and knowledge elements could be presented to the advisory committee for their review and approval.

On January 16, 2002, the fourth meeting of the Computer Security Advisory Committee was held at NCC. Committee members reviewed the course coverage and sequencing that had been prepared by Dr. Belon and Dr. Wright, examined the content of the three proposed courses, and made suggestions regarding the proposed course sequencing. All members present gave their approval for moving the completed degree application forward through the academic approval process. During the following week, the remaining committee members who had not been able to attend the January 16 meeting had e-mailed their comments and given their approval.

By the end of January 2002, the program articulation agreement between NCC and WCSU for the Computer Security degree program had been revised to streamline the student transfer process.

The Degree Approval Process (February 2002 – September 2002)

The formal application for accreditation and licensure of the Associate of Science in Computer Security was presented to the NCC Computer/Information Systems department at its February 2002 meeting. The department summarily approved the three proposed security courses, as well as the total degree package. Immediately afterwards, the application received the academic dean's support and signature. The degree package then was forwarded to the NCC Curriculum Committee chairperson for distribution and action at their March 20, 2002 meeting.

In the meantime, at the early March meeting of the President's IT Advisory committee, the President of NCC was urged to call a special faculty meeting in order to expedite faculty approval of the Computer Security degree program. He acted accordingly and scheduled the meeting on April 8, 2002.

On March 20, the NCC Curriculum Committee voted to approve the Computer Security degree program and the three new courses. However, at the end of the meeting, concerns were raised that the liberal arts requirement might not be met, depending on the electives a student selected. Since there was a chance that the degree program might be voted down when presented to the full faculty on April 8, Dr. Belon successfully petitioned the Curriculum Committee to accept a one-course addition of another liberal arts elective to the application.

On April 8, 2002, the NCC faculty approved the degree application. The meeting was contentious. Although the substance of the degree program received strong faculty support, a major concern was expressed over the novelty of a two-year

computer science program articulating with a four-year MIS degree program in a business school. Since there is no Connecticut community college regulation that stipulates that new degree programs must be presented with already completed articulations with four-year schools, Dr. Belon could have avoided a great deal of aggravation had she not coupled the articulation agreement with the degree program.

With the passage of the Computer Security degree program by the NCC faculty, the full degree package was sent to the Connecticut Community College Board of Governors on April 10, 2002. Over the next three weeks, the central office staff reviewed the application and called for minor changes. The degree was sent out for review, and is scheduled for action at the June 17, 2002 meeting of the Board of Governors. Assuming that the Board of Governors approves the degree, the final step will require the application package to be presented to the Connecticut Board of Higher Education for accreditation and licensure in September 2002.

Conclusion

Many more undergraduate cybersecurity degree programs are needed to meet the growing demand for security professionals in the public and private sectors. In order to better address the regional needs for security professionals, two-year and four-year educational institutions should involve area business and government professionals in the curriculum development process. The benefits of such a collaborative process are numerous: improved working relationships, new working relationships, additional networking opportunities, enhanced goodwill, and added public exposure for the organizations and educational institutions involved. In addition, stronger ties and quality programs between two-year and four-year institutions provide lasting benefits to the students and faculty, as well as to regional businesses. Both NCC and WCSU believe that the process followed in developing the Computer Security degree program has produced a quality program that will greatly benefit our institutions and our regional constituents.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Case Study: Creation of a Degree Program in Computer Security	
Author(s): Barbara Belon, Ed.D. and Marie Wright, Ph.D.	
Corporate Source: Norwalk Community College	Publication Date: May 13, 2002

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
1	2A	2B
Level 1	Level 2A	Level 2B
✓ Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) and paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Signature: Barbara J. Huffman de Belon	Printed Name/Position/Title: Director, CIT Barbara J. Huffman de Belon
Organization/Address: Norwalk Community College 188 Richards Avenue Norwalk, CT 06854	Telephone: 203-857-6839 FAX: 857-7297 E-Mail Address: bbelon@nrcc.commnet.edu Date: 7/24/02

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, *or*, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

Eric Clearinghouse for Community Colleges
3051 Moore Hall/UCLA
Box 951521
Los Angeles, CA 90095-1521

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
4483-A Forbes Boulevard
Lanham, Maryland 20706

Telephone: 301-552-4200
Toll Free: 800-799-3742
FAX: 301-552-4700
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com

EFF-088 (Rev. 2/2000)